

Mais les raisons qui militent en faveur d'une cause objective et circumsolaire prennent une force invincible quand on interroge les élémens lumineux du phénomène.

En effet, le spectre de la couronne s'est montré dans mon télescope, non pas continu comme on l'avait trouvé jusqu'ici, mais remarquablement complexe. J'y ai constaté :

Les raies brillantes, quoique bien plus faibles, du gaz hydrogène qui forme le principal élément des protubérances et de la Chromosphère ;

La raie brillante verte qui a déjà été signalée en 1869 et 1870, et quelques autres plus faibles ;

Des raies obscures du spectre solaire ordinaire, notamment celle du sodium (D.) Ces raies sont bien plus difficiles à apercevoir.

Ces faits prouvent l'existence de matière dans le voisinage du Soleil, matière qui se manifeste dans les éclipses totales par des phénomènes d'émission, d'absorption, et de polarisation.

Mais la discussion des faits nous conduit plus loin encore.

Outre la matière cosmique, indépendante du Soleil, qui doit exister dans le voisinage de cet astre, les observations démontrent l'existence d'une atmosphère étendue, excessivement rare, à base d'hydrogène, s'étendant beaucoup au de-là de la Chromosphère et des protubérances, et s'alimentant de la matière même de celles-ci, matière lancée avec tant de violence à travers la photosphère, ainsi que nous le constatons tous les jours.

La rareté de cette atmosphère, à une certaine distance de la Chromosphère, doit être excessive ; son existence n'est donc point en désaccord avec les observations de quelques passages de comètes près du Soleil.

Neelgherry, Sholoor, 19 Décembre, 1871.

Letter from Col. Tennant to Dr. Huggins.

At 8 A.M. I sent you the following telegram :—

"Thin mist, spectroscope satisfactory. Reversion of lines entirely confirmed. Six good photographs."

I have now just come down the hill, leaving my able assistants to dismantle ; and I hasten to give you a sketch of what has been done, to go by to-night's mail.

At 19^h 31^m 50^s I saw a projection from the Moon's cusps, and on this set the slit of the spectroscope. Herschel saw *many lines*. He wished to note, but by a misapprehension I did not give him the signal till some twenty seconds later, when he got a few from the rapidly moving cusp which I was following. This ended at the apparent top of the Moon by the slit passing through a prominence.

The lines appeared rapidly one after another, and I believe it would have been impossible to record them or to identify more than one or two previously marked with pointers.

I then, by agreement, came to the centre of the Moon, which was reported blank. We placed the slit across the edge of rift whose position (that of the edge) I estimated at 120° from the vertex. It was about $10'$ from the Moon, and K 1474 was, I believe, the only result in lines, and it seemed to cross the field; but to this point sufficient attention unfortunately was not paid, from my having omitted to tell Herschel what he was looking at. I then turned to a thin rift truly above the Sun, and some $8'$ away from the Moon. K 1474 was again only the result, though in both cases Herschel seems to have seen *traces* of lines. I then about doubled the distance from the Moon. I had still light, and saw the rift; but Herschel had no lines. Finally, I approached the rapidly coming edge of the Sun, and lines began to come quickly, but the Sun was out before any could be recorded.

I have only had a conversation with Herschel, and he cannot see this before it goes and correct it, so that I may be wrong in some detail, but, I believe, this is what he reported.

For myself I was using the Directing Telescope on what we have unanimously called the Twins. I was intent on following the cusps for Herschel, and thus lost the opportunity of examining the polarization of the light which first threw out the whole Moon. I had my attention specially directed to the chromosphere and prominences at the true bottom of the Moon's limb. They first appeared *white*, and then changed through pink to red. I am quite confident that I saw no blue or green tinge. You will remember my suspicion that I do not readily see blue when faint, but I am sure the tint was not strong. My waiting in the Moon's centre gave me an opportunity of looking about me, and I saw the two rifts I have spoken of. To me they did not reach the Moon's edge, but were separated by some minutes of bright corona. The corona's outer layers were undoubtedly radiated, but not coloured. There were alternate gradations of light; that is, light and comparative darkness, but certainly no colour. The rays were lost as they neared the Moon. The rift at the true vertex of the Sun I am sure did not change, nor I believe did any other. Colonel Saxton had made for my object-glass a loose cap of pasteboard, with a two and a half inch aperture to be used during the Sun's presence; this was to have been knocked off just before totality. I forgot this, but I doubt if I should have improved matters; I used the power 35.

I had asked Captain Morant, R.E. (to whom I am indebted for a very great amount of assistance), to take a very beautiful reconnoitring telescope by Dallmeyer, which was mounted on a stand. Of 14 inches focus, it has also power (15) and an aperture of 1.75 inches. He (Captain Morant) made two sketches of the corona, which generally confirm, as does his description, all I have described. He expressed himself positive as to the absence of colour and the permanence of rifts, &c., in certain positions (not mine), and only differed in thinking that the shades

were of a sepia tinge (brownish) and that the rifts did extend to the Moon.

Now to the photographs. We have had some glorious mornings. Yesterday Herschel and I were up at *Argus*, but had no great amount of examination, as our intention was to focus slit, &c. on stars. Though the evenings have been misty, at times the mornings have been very clear, and we hoped they would remain so. Last night was very clear, and continued so till about 2^h 30^m a.m., when it became cloudy, and afterwards rained slightly. By the time for getting up it was less thick, and rain had ceased, but a wind had sprung up from the S.E. (I believe), which, of course, kept a driving mist on the hill. The Sun seemed to lose as much power by obscuration as it gained by rising, and was powerless to disperse this, as it would otherwise have done, and our instruments were *dripping*. This I had thought possible in such a case, but I had hoped that the fine weather had set in, as such mist seems abnormal so late in the season. Very few minutes after totality the mist vanished from the returning heat.

Under these circumstances one might have thought photographs hopeless, and I went despondingly to ask for results. I found, to my great astonishment, that they had six apparently good ones, which is due to Hennessy, who exposed, having thrown over our programme, and increased his exposures, while Captain Waterhouse, who did the photographer's part ably, backed him by rapidly changing the slides.

A more careful examination than I could make before my telegram left, showed me that one of the photographs (the sixth) was imperfect, and, as luck would have it, this met with an injury by the removal of a portion of the film in the corona. The others are good. In all the Moon is elongated (from motion?), but the rifts and radiated structure of the corona are clear, and the unchangeability seems, by a rapid examination, confirmed. For more than this I have not had time, as we got breakfast early, in hopes of getting all the instruments down-hill to-day, and I left soon after to my letters.

Herschel fitted up the Royal Society's 5-inch (in a way which he will, doubtless, describe) as an integrator, and instructed Col. Saxton in its use. I believe the reversion of the main lines was seen with it, but during totality only K 1474.

Ootacamund, Dec. 12, 1871.

Dr. Huggins has also received from Mr. Nursing Row, Fellow of the Society, a letter dated Dara Gardens, Vizagapatam, 13th Dec. 1871, containing an account of his observations of the Eclipse. The position of the Observatory is Lat. 17° 42' 9" N., Long. 83° 22' 30" E.; the computed times were—

		h	m	s
Beginning	.	7	0	24
Greatest Phase	.	8	1	36
End	.	9	6	2

the magnitude being .629. The Eclipse was well seen, not a cloud in the vicinity of the Sun, and according to the observations the errors of the predictions were, for the beginning -12 seconds, for the greatest phase +10 seconds, and for the end +33 seconds.

After the greatest phase, the edge of the Moon's limb on the Sun's disk was observed, somewhat rough and uneven. At about six minutes to the end of the Eclipse this uneven edge attained a tinge of yellow colour, undulating. At the greatest phase the light of the Sun was dull, and on grassy grounds looked pale yellow.

A mean of the meteorological observations was forwarded, containing observations of the solar radiation and the humidity for every ten minutes. The radiation observations were made with the solar-radiation thermometer, exposed freely to the Sun's rays in an open grassy place at the height of one foot from the ground, resting on two pieces of forked stick. The instrument was graduated on the stem, and had no attached scale, but enclosed in a large tube with a large bulb at one end, in the centre of which was the thermometer-bulb covered with lamp-black. The large tube was expanded with air and hermetically sealed.

There was also inclosed the copy of a sketch of the Sun's image previous to the beginning of the Eclipse, showing the positions of the spots then visible.

Meteorological Observations taken during the Time of the Eclipse,
12th December, 1871.

Hours. h m	Barometer.	Dry Bulb.	Wet Bulb.	Humidity.	Solar Radiation Thermometer.	Kind of Clouds.	Clear Sky.
7 1	30.138	73.5	67	69	40	ci	80
7 11	30.138	73.8	67	67	42	ci	85
7 21	30.142	74.3	67.5	68	46	ci	95
7 31	30.148	75.3	68.5	68	50.5	ci	95
7 41	30.154	75.6	68.5	68	50.5	ci	95
7 51	30.156	75.7	68.5	68	49	ci	95
8 1	30.160	75.8	68.7	68	48	ci	99
8 11	30.166	76	68.8	68	49	ci	90
8 21	30.170	76	68.8	68	51	ci	90
8 31	30.174	76.2	69	68	62	ci	90
8 41	30.180	76.5	69.1	68	68	ci	90
8 51	30.184	77	69.5	67	77	ci	90
9 1	30.192	77.2	69.8	68	82	ci	90
9 6	30.196	77.5	70	67	86	ci	88